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Meteors with Curved Paths. By W. F. Denning.

The term "erratic" applied by Mr. Hopkins to such meteors as display curved paths appears to me inappropriate. Erratic meteors are usually understood to refer to such of these bodies as belong to unknown systems, and are therefore synonymous with sporadic meteors. The title has also been employed to denote meteors which, though probably emanating from known showers, exhibit a certain discordance in their directions, though such discordance may have been induced by perturbations exercised upon them far beyond our atmosphere, and has nothing to do with the curved paths they sometimes pursue when under ignition. The term adopted by Mr. Hopkins is not expressive of the peculiarity to which he refers it. Such words as devious, sinuous, deflected, or tortuous meteors would be preferable, as conveying a distinct idea of the anomalous flights alluded to.

As a rule, I believe the alleged crooked paths are nothing more than mere impressions. The curious flickering in the light of individual meteors often giving rise to considerable alternations in their apparent brilliancy, combined with the fact that these phenomena rarely last long enough to ensure a steady view, occasion the idea of curved flights. The observer is seldom looking towards the exact place of a meteor's course, and the glimpse he obtains is more or less hurried, imperfect, and erroneous.

On December 20, 1886, $13^{\mathrm{h}}\ 11^{\mathrm{m}}$, I was watching for shooting stars and looking towards the immediate region of *Gemini* and *Cancer*, when suddenly a brightish meteor shone out north of β *Leonis*. Instantly directing my eyes to the spot, I caught the end-course well, and received a very strong impression that the path was much crooked or curled, but about $1\frac{1}{2}$ sec. later a bright streak of phosphorescence came out on the course of the meteor, and I saw it was perfectly straight along its whole length. My idea as to the bent path was therefore quite illusory, and due to the scintillations of the meteor in its rapid flight which I had seen but imperfectly. I may add, that of some thousands of meteor streaks and trains observed here at various times very few have shown decided curvature.

In 1885, out of a total of 1,334 meteors recorded (omitting Andromedes of November 27), I noticed four which were conspicuously curved. In 1886 I saw 1,431 meteors, of which about fifteen exhibited the same peculiarity in a striking degree. One of the best examples of these was recorded on December 25, 1886, $8^{\mathrm{h}}\ 22^{\mathrm{m}}$. The meteor was 3rd mag. and moved very slowly

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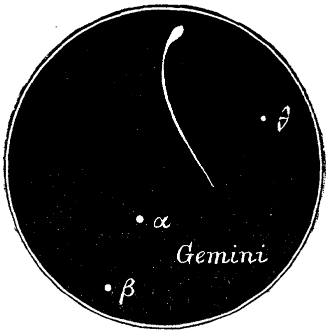
from between α and θ *Geminorum*; at the end it curved upwards so:—



Meteors are not infrequently broken during their flights and are observed to wax and wane several times before final disappearance. The large meteor of November 17, 1886, revived seven or eight times during its long flight of 63°, which it performed in seven seconds. Fireballs of the finest type are often accompanied with a series of outbursts and brilliant flashes directly resulting from increased combustion at certain points of their courses. Meteor streaks and trains are sometimes separated into three or four visible parts, but they are almost invariably sections of a straight line until they begin drifting under the influence of atmospheric currents, which occasionally mould them into grotesque, serpentine forms before they entirely fade from view.

As to the meteor of December 4, 1886, quoted by Mr. Hopkins, the phenomenon he describes must have been due, as Colonel Tupman suggested, to the nearly simultaneous appearance of two meteors with parallel paths, and hence, presumably, belonging to the same radiant. But the difference of 30′ is so small that it seems to me quite inappreciable when the circumstances of such observations are considered. Occasionally the beginning or end point of a meteor's flight, when near prominent stars, may be noted very accurately; but the details of the slight curve and secondary raised track of the meteor described by Mr. Hopkins would be far too trivial to be noticed by my eye or, I venture to affirm by any other eye not endowed with extraordinary powers.

Bristol: 1886, *Dec.* 31.

Erratum (in some copies).

Monthly Notices, vol. xlvii., page 56, the 8th and 9th lines from the top should be inserted between the 2nd and 3rd lines from the top of page 55.

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